

# SUPPLEMENT TO THE MYSORE GAZETTE.

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## MISCELLANEOUS PAPERS.

### REPORT ON THE IRRIGATION PROJECTS OF MYSORE AND COORG.

No. 3828—507.

MYSORE PUBLIC WORKS DEPARTMENT,  
CENTRAL OFFICE.

From—MAJOR R. H. SANKEY, R. E.,  
Chief Engineer of Mysore.

To—The Secretary to the Commissioner  
for the Government of the Territories of  
His Highness the Rajah of Mysore,

Civil Works  
Agricultural.

Dated the 19th November 1866.

Sir,

I have the honor, after some unlooked for delay, to reply to Circular No. 25 of the Government of India, dated 22nd March 1866, calling for information regarding irrigation projects which, while proving remunerative to the State, should be primarily "calculated to prevent the occurrence or mitigate the severity of drought and famine," and requesting that a "review be made of the projects completed and in progress."

3. Excepting in the Mulnád or rainy tracts of the Western Ghauts, it is almost needless to say that the first necessity of a fixed society, next to that of providing itself with shelter, must have been the construction of reservoirs for arresting and storing up the rain-fall which, from the peculiar conformation of the ground, and nature of the soil, would otherwise have escaped to the sea, or been lost in other ways.

4. The storage of water for irrigation, doubtless followed closely on its collection, simply for domestic

purposes. In all the open country we therefore now find that population has little or no existence, excepting in connection with works of this description. And hence, to deal with the immediate and pressing wants of a people so situated, attention must of necessity be primarily devoted to the repair, development or re-construction of existing tanks and channels. As regards entirely new projects, their superior attractiveness to the Engineer will sufficiently ensure their not being forgotten.

5. It will be sufficiently obvious from these brief remarks that the subject as proposed by Government, has here a widely different signification to what it necessarily would have in Northern India, where, from the presence of other physical characteristics, irrigation is for the most part a late introduction, and modern Engineers have had, so to speak, a "tabula rasa," wherein to sketch their projects.

8. \* \* \* \* \* Mysore gives birth to all the great rivers, of the southern portion of the Peninsula, and has therefore a primary natural right to the use of their waters, a position, which it will be shewn further on, her people have not neglected.

9. To elucidate this portion of the subject, I have drawn up the appended Statement A. shewing the length of the principal streams; the areas of their catchment basins, as also the portions actually utilized under the tank system, and accompanied by remarks which, taken with the figures, will, it is hoped, afford a general, though doubtless, imperfect idea of the economic value of each.

10. The following table summarises the information thus afforded.



MYSORE RIVER SYSTEMS.	Total length of the main rivers with their principal affluents within the Province.	Area over which the drainage is unintercepted by tanks in Mysore.	Area over which the drainage is intercepted by tanks.	Total area of each catchment basin.	Percentage of whole area under the Tank System.
	Miles.	Square Miles.	Square Miles.	Square Miles.	
I. Kistna River ... ..	611	4,814	6,217	11,031	56.47
II. Palar ... ..	47	0	1,036	1,036	100.00
III. Pennair ... ..	167	334	1,946	2,280	85.35
IV. Pennaur ... ..	32	222	1,319	1,541	85.60
V. Cauvery ... ..	646	5,526	5,769	11,295	51.75
VI. Western Coast Rivers	103	1,881	0	1,881	0
Totals for Mysore & Coorg	1,606	12,777	16,287	29,064	56.16
Deduct Coorg.	..	1,795	..	1,795	..
Remaining for Mysore.	1,516	10,982	16,287	27,269	59.73

11. Were the revenue survey complete, it would be an easy matter from this to give the precise area of wet cultivation under each stream, the work done, and rent paid for their waters; but with the present inexact returns, it is useless to do so.

12. It will be observed that of the 27,269 square miles covered by Mysore, nearly 60 per cent has, by the patient industry of its inhabitants, been brought under the tank system. Unless under exceptional circumstances, none of the drainage of these 16,287 square miles is allowed to escape, or rather *should*, with proper attention, be allowed to escape, were all existing works in their normal condition. To such an extent has the principle of storage been followed, that it would now require some ingenuity to discover a site within this great area suitable for a new tank. While restorations are of course feasible, any absolutely new work of this description would, within this area, be almost certainly found to cut off the supply of another lower down the same basin—to interfere in fact with vested interests.

13. The activity of the nation has, by no means however, been confined to this extent of work, vast as it is. In addition to the river works, which will hereafter be alluded to, there are an enormous number of small tanks, scattered throughout the rainy tracts of Mysore and Coorg; to a great extent buried in forest glens.

14. The rice lands here are narrow, low lying strips placed between the spurs of the hills, retentive of moisture, and only require "a tank or dam large enough to supply water, if necessary, three or four times at the most critical period of the season. These reservoirs are too small to preserve water through the dry season, and are made without sluices or stone facings; so that the water below the kodi [waste weir] level is let out by cutting the

"bund" This system also applies to "tota" or garden land (see Mr. Stokes' Report of 19th May 1838).

15. In two points these small tanks, common alike to the Nugur Mulnád, Coorg, &c., differ essentially from those which I have classed under the Tank System. *First* they are all individually small, placed at the head of each minor valley, and meant only for occasional use. *Secondly* they do not exist in chains, and are consequently not mutually dependent for safety one upon the other. Being in their nature very little open to improvement, they do not affect the immediate question raised by Government, and consequently do not call for further notice.

16. It is almost unnecessary to remark that of the various physical causes which, while rendering possible, have at the same time fixed the limit of the tank system "*ceteris paribus*" the actual quantity of rainfall is by far the most important, and as this again depends mostly on elevation above sea-level, I have endeavoured to record the obtainable information on both heads in Maps Nos. II and III.

17. The facts as regards rainfall are taken from a very complete compilation by Major Puckle, of registers kept at Bangalore, Toomkoor, Shenoga and Mysore from 1837 to 1860, with such information as could be gleaned from other sources; and the heights above sea-level, have mostly been fixed barometrically by the same officer, General Green, and other observers.

18. Regarding the elevation of the Mysore plateau, it will suffice here to note, that while points on the same latitude, along the northern and southern frontiers, have an elevation of about 2000 feet above the sea, there is a general rise of from 1000 to 1500 to the central watershed line dividing the northern and southern river systems. This line in fact fairly divides the country into two nearly equal areas. Though fewer heights along the Western



Ghatts have been fixed than could be wished, it may be assumed that their general elevation ranges from 4500 to 6000 above sea-level, or from 2000 to 3000 above the Mysore plateau.

19. There being a generally received opinion that the amount of rainfall was very much greater in former years than at present, I shall here venture, at the risk of being considered tedious, to shew that such is not really the case, and that the Western Ghatts regulate in the most remarkable manner the amount of rain.

20. This is a matter of considerable importance. For once it is clearly recognized that the forces to be contended with are under control, breached tank bunds, with the adoption of proper measures, should not again be heard of.

21. That the climate has apparently been much as we now find it from the earliest geologic period, might be assumed from the fact of there being no sedimentary rocks in Mysore, and consequently nothing to shew the occurrence of that alternate depression and elevation above sea level which would have induced a change in climate. The tank system itself is clear proof of this unchangeableness since the first occupation of the country by man. It may be accepted that the wasteweirs of these reservoirs have if any thing been improved and increased in capacity as society advanced, and repeated disasters to the bunds compelled, yet we now find these works, as a rule, only barely sufficient for the present amount of rainfall. In many cases they are altogether insufficient or entirely wanting.

22. Dr. Buchanan writing in 1800,\* gives some historical evidence to the same fact.

\*Journey through Mysore, Vol. 1. Page 360.

He observes, "the people attribute the state of the country partly to the oppression of the former Government and partly to the uncommon scarcity of rain, which prevailed for ten years." Frequent notices to the same effect are found throughout his elaborate and interesting work.

23. Hence there would appear reason to conclude that Mysore has been always as we find it now † "a dry and thirsty land," and will remain the same, so long as the relative elevations of the plateau and the ghatts continue.

24. But the functions of the ghatts would appear also to extend to the regulation of the extreme limits of both the annual and diurnal rainfall. We find for in-

† Professor Maury explains the cause of this, observing with reference to the action of the S. W. monsoon winds, "these then 'come from the Indian Ocean and sea of Arabia loaded with moisture, and striking with it perpendicularly on the Ghatts precipitate upon the narrow strips of land between this range and the 'Arabian sea, an amount of water truly astonishing.' Adding immediately afterwards. 'These winds of India then continue this course to the Himalaya range as dry winds.' (*Physical Geography of the Sea.*) The Cuddapah, or eastern coast range seems to perform the same office as regards the North-East monsoon.

stance by Major Puckle's analysis before alluded to, that while the rainfall in England has varied from 19.5 inches to 67.5 in different years, Mysore exhibits similarly if not indeed even more, equable results for the last 30 years as shewn below:—

Places in Mysore.	Greatest annual rainfall.	Least Ditto.
Bangalore .....	55.1 in 1852	15.9 in 1838
Mysore .....	52.8 ditto	16.8 in 1840
Toomkoor .....	57.4 ditto	13.0 in 1838
Shimoga .....	42.8 ditto	15.3 in 1855

and if the maximum diurnal rainfall be compared with the recorded facts of other tropical countries, the absence of great extremes here would suffice to establish for Mysore a very exceptional position.

25. Judging by comparison \* \* it would appear that 60 inches of rain per annum has limited the tank system; while with from 30 to 35 inches every drop that has fallen in the country has been successfully stored. If this latter amount of rain could be counted on, there would be little cause to fear even a scarcity of food, much less a famine, but this is unfortunately not the case in exceptionally dry years; and is more particularly observable in an almost rainless tract which I shall now advert to.

26. It will be observed that over a large sector extending from Cudoor through Rainless tract. Hosiroog, the Mauri Cunawai, Herioor, Dodary, and Mulkalmocroo, with a great extent of country on either side, the rainfall ranges only from 10 to 20 inches per annum. And that this is due to the action of the towering mass of the Bababooden Hills [Culhutti Peak 6000, Moolanghery 6350,] which stands across the path of the vapour bearing S. W. Monsoon, I have endeavoured in a previous report \* to shew.

27. Whatever the reason, however, the country is comparatively to the rest of Mysore rainless, at times almost absolutely so. Ravaged by no less than eleven Mahratta invasions, between 1760 and 1792, the unfortunate inhabitants, have also from this physical peculiarity, periodically been subjected to the still more dreadful horrors of famine.

28. Referring to Buchanan we find, "In the reign of Hyder this town (Herioor) suffered considerably from the Mahrattas, and was plundered by Pursooram Rao. The ravages of this chief were followed by a dreadful famine, which swept away all the inhabitants," and again,

\* Memorandum on the Mauri Cunawai, dated 29th January 1863.



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 "I passed through several ruined villages and it is said  
 "never to have been better in the memory of man."

29. What the people of this district suffered since  
 the early part of the present year, it would be difficult to  
 say. Early in March the tanks

Sufferings of the pre-  
 sent year. began to run dry, and towards the  
 end of April, they were almost com-  
 pletely so, not to be replenished till late in September or  
 early last month. At the best of times in this period,  
 there was little else than liquid mud to be procured for  
 domestic purposes. Cholera broke out again and again  
 cutting off all communication between each wretched village  
 and its neighbours. There being neither fodder nor water,  
 the cattle, upon which the ploughing for the following  
 years depended, died in vast numbers; and spite of every  
 exertion on the part of the civil officers, and particularly  
 Lieut. Pole of this department, in giving out tank and  
 other work, it is much to be feared that disease and famine  
 have swept away a large proportion of the inhabitants.  
 As it is here chiefly, that the humane intentions of Govern-  
 ment may, above all, find fitting scope, several works of irri-  
 gation, will, it is hoped, find place in the forthcoming  
 Budget. These will be specially alluded to further on.

30. To the above imperfect sketch of the chief  
 physical characteristics, which have either favoured or  
 limited the tank system, I would add one or two brief  
 remarks on others which have affected favourably, or  
 otherwise, the construction of irrigation works generally.

31. The first of these is the generally undulating  
 character of most of the open coun-  
 try. Totally unlike the wide plains  
 of Northern India, there is probably  
 not a square mile in the whole country absolutely flat or  
 level. While in the Carnatic the slopes of the country  
 are not much more than 4 feet per mile, they here range  
 from 10 to 20 in the flat portions, and as high as 60 and 80  
 feet elsewhere. The original cost of storage in Mysore  
 as also the risks have thus been proportionably enhanced.  
 The channels drawn from the several anicuts moreover  
 for the same reason command relatively but little ground,  
 the rapid side-slopes preventing their drawing away, to a  
 sufficient distance from the river margins.

32. The second point in which there has always  
 been a considerable disadvantage, is  
 the incoherent nature of the soil, which  
 over the greater portion of Mysore, is  
 chiefly red and sandy, resulting from the disintegration  
 of gneiss. Pure clay is mostly to be found in nests or  
 decaying felspar, &c.,—and is necessarily rare. Hence  
 good puddle, that essential in all reservoir work, has been  
 wanting. Leakage is therefore common, and water in  
 motion rapidly works its way, soon destroying all below  
 it. West of Seerah and throughout the catchment basins  
 of the Haggary and Soolikerray, a decaying metamor-  
 phic rock of a crystalline ferruginous character prevails,  
 with a great extent of cotton soil, neither of which are of

any use for the manufacture of puddle. The tank bunds  
 here have therefore been formed under great disadvan-  
 tages.

33. In the matter of stone, Mysore is highly favour-  
 ed, as the prevailing gneiss rock,  
 where the cleavage is horizontal, splits  
 off readily in large sheets from three inches to two feet in  
 thickness, by the simple application of heat to the upper  
 surface. By punching small holes, these sheets can by  
 wedging be divided with great precision, into fairly even  
 slabs of almost any dimensions, thus affording at once a  
 most valuable material for all such works, as anicuts,  
 codies, [tank waste-ways] sluices, over-falls, &c.\* Stone  
 telegraph posts thus prepared and 25 feet high have  
 everywhere been employed. The natives have apparently  
 used this material from time immemorial, though the  
 ordinary pitching of their tank bunds, is for the most part  
 formed of rough natural blocks, picked up in the neigh-  
 bourhood. Sometimes also they have employed round,  
 worn, or disintegrating stones, which are of course quite  
 unfit.

To the general excellence of the stone and  
 its universal applicability, may, with  
 possibly the scattered nature of the  
 lime deposits, be attributed the practice  
 of making the stability of all anicuts and over-falls to  
 depend solely on the size, and position of the individual  
 blocks used in the work, instead of on the homogeneity and  
 cohesiveness of the mass. This serious constructive error,  
 which has caused endless trouble and expense, will be  
 noticed more particularly further on—meanwhile it ap-  
 pears undesirable to defer longer such observations as I  
 have to offer on number, construction, and repair of the  
 tanks considered individually, with the best method of  
 meeting the objects proposed by Government.

35. By the returns of 1853—54, there were 28,450  
 tanks in Mysore classed as municipal  
 or unirrigating, and irrigating. Of  
 this enormous number there were  
 4106 large irrigating reservoirs,  
 18,737 small, and 8,609 unirrigating, giving over all  
 about 1 tank per square mile in the gross.

36. In 7 taluqs of Colar, where there are moderate  
 conditions of rain-fall, and no reservoir of extraordinary  
 size, there were 1 find 3,611 tanks, of which 2,950 were  
 irrigating—the proportion being 1 village, and 1.07 irri-  
 gating tank to the square mile. The average quantity  
 of wet cultivation was 10 acres under each, but this is  
 of course not wholly to be depended on.

\* In the High School, Bangalore, columns 35 feet high and  
 not over 15 inches square have been used of this material. It  
 is also employed for architraves, and for bridge girders up to  
 11 feet span. Extreme hardness has, however, prevented its use  
 as dressed stone, excepting under very exceptional circumstances.



37. Turning to the rainless tract (paras 26, 27 & 28) taking the Talooks of Hosdroog, Davengherry, Cancoopah, Moolcalmooroo, Harnhully, and Boodihaul, in all there were 1,009 tanks registered, the proportions being 0.47 villages and 0.31 irrigating tanks per square mile, while under each of the latter there were only 2.5 acres of wet cultivation on an average. Allowing the returns to be relatively, (though not absolutely correct, it would thus appear that in these barren famine stricken talooks, there was only one quarter of the wet cultivation in equal surfaces of country as compared with Colar. While more-over the average of population was, by the last Administration report, 151½ per square mile for the whole of Mysore, I find that in these tracts there was only 71.

38. The classification simply into "large" and "small" is, as affording no clue to capacity or irrigating power, extremely vague; and under the first head especially there are some truly gigantic reservoirs which deserve separation from the rest.

39. Among these latter, I would specially mention the Nugur Soolikerray, which has a Large reservoir. margin of some 40 miles, a bund 1,000 feet long, 84 feet high, and having a breadth of base of upwards of 600 feet; the Mudduck Tank which is the terminal reservoir at the head waters of the Vedavutty having a bund 1,220 feet long 90 feet high and 660 feet broad at base; also the great Mooteetala, situated north of Seringapatam, on one of the feeders of the Lokani river, adverted to as follows by Buchanan.\* "Two mountain torrents here had united their streams, and forced a way through a gap between two rocky hills. "Rama Anuga" stopped up this gap by a mound said to "be 78 cubits high, 150 cubits long, and at the base 250 cubits thick. The superfluous water is let off by a "channel, which has been cut with great labor through "one of the hills, at such a height, as to enable it to water "a great deal of the subjacent plain, which is three or "four miles in extent."

40. Works of this kind are however a class "*per se*." Originally, being natural basins, it was only needed that the gap, between the two hills guarding the outlet of the valley, should be filled up, and a good position for the waste weir secured. Precisely such positions are those of the Coombar Cuttay, and Mauri Cunwais situated in the line of hills south of Heerioor. As both these works are now being estimated for, and as particularly the latter has long engaged the serious attention of Engineers, I may be pardoned a further short extract regarding it from the author above quoted.

41. Dr. Buchanan observes regarding this: "At "a place called the Mauri Cunwai, they say that by "building a mound between two hills 500 yards distant "an immense reservoir might be formed which would

"convert a large portion of the Heerioor district (talug) "into rice grounds."

42. The ordinary Mysore tank is, however, a much longer and lower description of work;

\* \* \* \*

#### TANKS.

\* \* \* \*

44. It is needless to observe that under Tippoo's Government, tanks were frequently breached either as a military necessity, or to gratify a whim, and that the irrigation works generally suffered most seriously from his reckless administration; and although the most strenuous efforts were made afterwards by the enlightened Dewan Poorniah, in the first years of the present century, peculation and fraud returned under the Rajah's Government, bringing the tanks, &c., into the dreadful condition, in which they were found on the resumption of the Government in 1831.

45. It will, I think, be conceded, that the area at any time actually under wet cultivation, is the best test of the efficient state or otherwise of the reservoirs, from which the supply of water requisite for that cultivation is derived. At least I know of no other, and therefore beg to insert here the following quinquennial return, for the 25 years between 1837—38 and 1861—62, obligingly supplied from the Commissioner's office.

Years		Acres under wet and garden cultivation.	Expenditure on agricultural repairs other than the Ashtigram Channels.	Average yearly outlay.
From	To			
1837—38	1841—42	17,05,150	Rs. 4,70,178	Rs. 91,036
1842—43	1846—47	18,19,759	4,32,251	86,451
1847—48	1851—52	20,87,929	5,86,443	1,17,289
1852—53	1856—57	21,53,309	7,00,205	1,40,041
1857—58	1861—62	21,39,040	8,07,619	1,61,524
Total outlay in 25 years.			29,56,699	1,19,868

\* The acreage here includes that under Channels, but the general argument is not thereby invalidated. By one return I find Rupees 5,75,369 were spent on channel repairs during the above period, giving an average of Rupees 23,014 per annum; but as this does not apparently include improvements to the Antients classed as "Original work," and which in the three years 1861—62, 1863—64, alone amounted to Rupees 1,01,333, I think it better to draw conclusions from facts less open to criticism.



Judging from this, the works are probably now in a more prosperous condition, than at any other time of which we have record, and the increase in efficiency has apparently fairly kept pace with the increased liberality in the expenditure, taking into account the great rise in labour rates of late years.

46. But when we come to examine accurately their real condition, we find that while admitting fully the progressive advance that has been made, the tanks are in anything but a satisfactory state. Further, that while individual repairs have been dealt with energetically and efficiently, there has been a clear want of a general plan of action under scientific direction. As a rule, breaches of tanks and anicuts have, on their occurrence, been vigorously taken up. But with all these cases, there has not been apparently that thorough sifting of causes, and reference to general scientific principles, which there can be little doubt is equally essential with energetic treatment.

47. The Executive Engineer of the Bangalore Division reports, that fully half the tanks under him are either breached, or in need of thorough repair. In Chituldreog 285 tanks, or one third of the registered number, are similarly out of order. In Toonkoor 530 out of 1121; in Shimoga 2496 out of 4520; and in Mysore 705 out of 1149. Captain Johnson, the most experienced Executive Officer in the province, states, with reference to the latter district, that three-fourths of the tanks require absolutely necessary improvement, and that one half are positively unsafe. It is this real condition of matters, with which we have to deal, if, as now determined by Government, the people are to be preserved by all human means from the effects of drought.

48. Without a much more complete examination of existing works, and in the absence of detailed estimates,

it would of course be quite impossible to say what would be the cost of the requisite renewals, &c., to the tanks now out of order; but assuming roughly that in all 1500 first class tanks and 4500 second class require the ordinary outlay now made in dealing with special cases [*i. e.* about 2,000 Rupees for each 1st Class and Rupees 1,500 for each 2nd class tank], the total outlay would probably not fall far short of Rupees 90,00,000. If the work was to be done on the yearly allowance recommended by Mr. Ewing in the last Administration Report [*i. e.* @ 4,00,000 per annum], it would take 22½ years to accomplish it.

49. The Commissioner having here dealt with the whole question of repair, I beg, for facility of reference, to note at foot paras 334, 335 and 336 setting forth his views.

334. The principal followed in effecting these repairs is a sound one, and should, I consider, be the basis of carrying out repairs and improvements of important irrigation works; that is, that the Civil Officers should provide the labor and the Public Works Department the supervizing skill.

50. If, as here promised, the ryots can by any means be induced to bear one third of the burthen, then about 15 years would suffice. But this of course keeps out of view, the fact of gradual deterioration of other works, calling for a steady outlay that must be met, so

335. As regards ordinary tank repairs it is, I consider, desirable in the interests of the country, that the existing system introduced in 1856, should be modified so as to give the Civil Officer greater scope of action in regard to such works. The accounts now rendered by them to the Controller under the Rules for minor works are sufficient for all purposes of check and audit, but it appears to me very desirable that the money available for irrigation repairs should be more absolutely at the disposal of the Civil Officers, and that the responsibility of the Public Works Department should be limited to professional advice when called for. It is also necessary that a larger sum should be devoted yearly to irrigation repairs, and with this object I would propose to fund the available surplus of the year 1865-66, say 4 lacs, as also that of future years, the amount to be at credit being held in deposit for the sole purpose of tank repairs to be executed by the Civil Officers. The system on which I would suggest its expenditure is, that the outlay on a tank should be a Government contribution in aid of the ryots, who, according to the old custom of the country, were bound to furnish labor for extraordinary repairs, the Government supplying the materials and supervision. Of late years, the ryots have silently ignored their obligations, and the whole duty and cost of repairing tanks both in regard to the requisite labor and material, have fallen on Government, so that, with rising prices and rates, the sum available for tank repairs bears no proportion to what it did in former days. I propose that out of the sum placed at the disposal of each Deputy Superintendent yearly, contributions be given by the Government for the repairs of such tanks as the District Officer considers most in need of attention, the aid to be in the proportion of 2 or 1 according to the exigencies of the case, and the comparative prosperity of the ryots. Such a system, while sure to be ultimately productive to Government, would initiate to a limited extent a return to the ancient custom of enforcing the ryots' obligations. Indeed, I am of opinion that while the Government have a right to demand from them their quota for repairs, having regard to the circumstance that we are giving them 30 years' lease, there will be a positive dearth of money under the present system, which must end in failure and the destruction of a great number of tanks. It has also been proposed to levy 2 annas in the rupee on the ryot for the purpose of establishing a tank fund, but as the tendency of this measure would be to take the control over the expenditure out of the hands of the District Officer, and to give rise to importunate demands from the ryots of every village where there happened to be a breached tank, I think the plan suggested by me is preferable. Major Wilks, writing in 1864, says that; "the average expenses of tanks ought not to be taken at less than 1,25,000 Rs. *i. e.* Rs. 3,75,000. We now give Rupees 2,00,000 to the agricultural repairs, and even of this sum, a considerable amount is devoted to the repairs of irrigation channels. The sum ought, in my opinion, to be doubled. As an instance of the existing state of the tanks, I may mention that the Chituldreog Deputy Superintendent sent in this year a list of tanks requiring repair, the proposed outlay on which aggregated 50,000, a sum which according to the Budget allotment, it is impossible to provide for a single District. The returns for the repairs of tanks being not only prospectively great, but



long as Government continues to occupy the position of landlord. In fact if my premises be correct, the work of bringing the Mysore Tank system fully up to standard is a very much more extensive one than has as yet been made apparent, and calls not only for special enquiry to determine general principles of engineering action, but such legislative enactments as will insure the preservation of the works now existing, and more especially those about to be put in an efficient condition.

if a proper selection is made and the work well done, repaying the outlay from 5 to 10 years, it is certainly advantageous for the Government to provide money, to the extent of the available labor, for the purpose. The tank registers which have been formed in each Talook, enable the District Officer to make a careful selection, there being naturally many tanks which, owing either to natural features or the great expense attendant on the work, it would not be profitable to repair. To remove, for instance, the silt from the bed of a tank is an operation which is many times more costly than raising the bund a few feet, and the escape a few inches, but it frequently happens that the nature of the country does not admit of the latter being done, while the former operation would entail too large an expenditure to be remunerative. Under the rules for the execution of works by Civil Officers, the Commissioner sanctions all estimates from Rupees 500 to 10,000; the Superintendents from 200 to 500; and the Deputy Superintendents all up to 200. Assuming 4 lacs as the basis of expenditure, the details might be regulated as follows preserving the same rule of sanctions.

Commissioner	...	...	...	1,50,000
Superintendent, Nundidroog	...	30,000		
Deputy Do Bangalore	...	20,000		
Deputy Do Toomkoor	...	20,000		
Deputy Do Colar	...	20,000	90,000	
Superintendent, Ashtagram	...	50,000		
Deputy Do Mysore	...	20,000		
Deputy Do Hassan	...	20,000	90,000	
Superintendent, Nagur	...	30,000		
Deputy Do Chikidroog	...	20,000		
Deputy Do Chadoor	...	10,000		
Deputy Do Shimoga	...	10,000		
			70,000	
			4,00,000	

339. I am not prepared to say that the Civil Officers would, in the first year, be able to work up to 4 lacs, but there is a marked improvement in the manner in which the repairs of tanks and the accounts relating to them are disposed of, so that the principle advocated by me would remain intact, whether greater or less latitude of action were given in the first year or two. The funding of a sum of money for the special purpose of repairing tanks would also be unaffected by the subsidiary proposal that the ryots should contribute their quota of the repairs. That a sum should be set apart for the object indicated, and that it should not be liable to be re-appropriated for other purposes, is the key of the suggestion I have made, and as the real prosperity of the country depends much more upon the substantial condition of these numerous minor works, than upon the prosecution of costly and difficult engineering projects, which entail great delay in execution, and give rise often to professional contentions, I think that a fair trial should be given to the proposal.

(See Administration Report of 1865—66.)

51. Looking at the vast amount of patient industry, and even drudgery, devoted by the native cultivators to the preparation of the ground under the tanks for rice cultivation, it must, to ordinary observers, be a strange matter that they never once dream of giving even an hour's work, to the preservation of the bunds, upon which the fruits of their labours entirely depend. Not only however is such actually the case, but with stranger fatuity still, they appear to do all in their power to render the bunds insecure. They cultivate, against orders, close under the foot of the embankment, they dig roots, cut firewood, make foot-paths in every direction, drive over their cattle and carts when possible, and in a hundred other ways loosen the soil and weaken the work. Not satisfied with this, they, against the most positive orders, temporarily build up the waste-weirs between the dam stones, with a view to increase the capacity of the tank, and thus almost insure the work breaching in case of flood. This is no imaginary picture, as I have reason to believe that several of the late breaches to tanks, have occurred from this reckless inattention to orders.\* But beyond all this, there are criminal acts such as cutting bunds, &c. to cause breaches, with the apparent object of reaping the advantage; first of the expenditure which will probably take place in repairing the work, and second in the abundant yield of the dry crops, sown in the rich loamy bed, while the work is out of action.

\* \* \* \* \*

\*The following rules were issued by the Commissioner under date 24th November 1863, similar to those in Madras; but I have not heard of their being acted on, and without a legal enactment, it is difficult to see how these provisions could be enforced.

#### RULES REGARDING THE CONSERVANCY DUTIES TO BE PERFORMED BY VILLAGERS TO IRRIGATION WORKS ACCORDING TO LOCAL CUSTOM.

##### I

It shall be the duty of the village authorities throughout the province, to enforce the performance of those minor works of conservancy and repair, which are sanctioned by local custom in each District as ascertained and defined by the Superintendent; and District Engineers shall, invariably, when submitting bills, for slight repairs or damages to irrigation works, report by memoranda attached to such bills, the circumstances under



which such repairs were not executed at the cost of the ryots.

The following are some of the most usual of those works:—

1. To fill up gullies or other inequalities caused by rain, the treading of cattle, &c, upon the bunds of tanks and channels.
2. To check the growth on bunds of the prickly pear, and any similar rank and pernicious weed.
3. To clear away such underwood from the bunds of tanks, as may be considered by the District Engineer to be injurious.
4. To clear out the deposits from tank sluices, and from river and spring channels, to such an extent as will afford a sufficient opening for the supply of water to flow to the ryots' fields.
5. To clear and repair the earth work of petty and branch channels, and clear away the accumulations in all channels issuing from tanks which obstruct the flow of water to the fields.
6. To keep in order the supplying channels of tanks, to such extent as is sanctioned by local custom.
7. To watch the bunds of all tanks during rainy weather; to turf the parts acted on by the waves, which appear liable to open and close the culverts; and generally to perform minor duties of this nature to prevent breaches and other accidents.
8. To construct ring dams at breaches, and where requisite to temporarily strengthen the bunds of tanks during the season of cultivation. And, in general, by that constant care and attention which residents on the spot can alone exercise, to preserve the works of irrigation, in which they and the Government have a common interest, from those small injuries which, if unchecked, will lead to serious loss and expense.

II

It shall be the duty of all village authorities, to hinder the ryots of their respective villages, from doing any thing which may tend to endanger an irrigation work; such for instance, as throwing up a bund in front of the culvert, to keep the water at a high level, making temporary cuts in the bunds of tanks, or introducing pot sluices into them. The village authorities will be held responsible for any damages occasioned by their neglect of this rule.

\* \* \* \*

55. The Establishment attached to this Department has, I need hardly say, been of wholly inadequate strength to do more than meet the most pressing emergencies, and that very inadequately, and consequently has never been in a position to deal, in any systematic manner, with the vast mass of Tanks, which covers the whole face of the country, in addition to the construction and repair of the great network of roads, of which in main lines alone, there are upwards of 2,000 miles in the province.

56. This is a subject to which I shall again venture to draw attention, but meanwhile in concluding the notice about tanks, I shall state briefly what works it is proposed to bring forward in next Budget, not so much as forming the commencement of the systematized work which I have ventured to recommend, but as an endeavour to meet the most urgent requirements, of the rainless and barren tract of country, which has suffered lately the horrors of famine as before adverted to.

57. I hope to be able to bring forward definitely the long-discussed project [amounting say to Rs. 9,00,000] for the Mauri Cunwai Tank, and Estimates are, it is understood, nearly ready for the Coambar Cuttay [Rs. 1,00,000] with 3 restorations of reservoirs in the Chituldroog Division amounting perhaps in the aggregate to Rs. 70,000. This, in addition to the ordinary tank repairs by Civil Officers, would afford, for the time being, great relief to the sufferers, while proving very remunerative to the State. The latter point will of course be fully stated in sending up the detailed Estimates.

58. The only other project of large dimensions is that of the Mysore Soolikerray or Cuddly Tank, a great terminal reservoir on one of the feeders of the Shimsha river, which, though commenced centuries ago by the natives, was never finished. The Estimate may be 1 lac or Rs. 1,20,000, and is understood to be well advanced.

59. I now beg to offer some observations on ancient channels, and other works \* \* \* and at the outset, as giving an idea of the capacity of the several rivers,

\*The remunerative returns promised on the usual tank repair Estimates, passing through this Office, vary from 20 to 40 and even 50 per cent on outlay, but there is no absolute proof that these percentages are realized, and as in the first place the cost of maintenance and risk is left out of the calculation, and in the second a general scheme, embracing all the tanks of the country, must of necessity take the bad with the good, the profits, though undoubtedly very remunerative must be struck at a lower figure, and probably on the average would not much exceed net 10 per cent all round.



and the vast field for improvement open to the Engineer, in utilizing the water which still escapes to the ocean, I would request an examination of the following table, of their maximum and ordinary monsoon discharges. This is not quite complete or reliable on all points, but much of it is so.

Mysore River Systems.	Names of Affluents.	Maximum flood discharges in cubic feet per second.	Ordinary monsoon discharges in cubic feet per second.	Remarks.
I. Kistna.	Toongabuddra.	2,07,843	50,000	Maximum discharge determined for the large bridge at Hurrehur; the ordinary monsoon delivery roughly calculated. Huggary carefully gauged at the Mauri Cunwai for two years. Both quantities assumed from area, locality and rain fall.
	Choardy.			
	Soolikerray.	50,000	4,500	
	Huggary and Chinna Huggary.			
	Wurda.	30,000	5,000	
II. Palar.	Palar.	40,000	3,000	Only Chittravutty and Papakeney gauged, giving respectively 23,100 and 5,244 Cubic feet in maximum flood; the rest assumed.
III. Pennair.	Jeemungle.			
IV. Pennaur.	Pennair.			
	Cooshavutty.			
	Chittravutty.			
	Papakeney.			
	Verushavutty.			
	Penaukeney.			
V. Cauvery.	Upper Cauvery.	2,39,000	18,000	Maximum flood gauged roughly at Bunnor below Seringapatam, and therefore below the junctions of the rivers named; the ordinary monsoon discharge is only calculated at 4 feet in depth, while 6, 8 and 10 feet are not uncommon.
	Somavutty.			
	Hemavutty.			
	Lutchmenteerth.			
	Lokani.			
	Cubbany.	70,000	7,000	Maximum flood at Nunjengode roughly calculated at 63,700 cubic feet; the rest is assumed.
	Aavutty.	50,000	3,500	Discharge calculated for bridge on new Maugady road.
	Shimsha.	50,000	3,500	Both assumed.
Totals for Mysore and Coorg.		7,37,243	74,500	

60. This estimate does not include the Western coast rivers which, so far as can be judged, are, with the exception of the Sheravutty or Gairsoppa river, altogether useless to Mysore as regards irrigation.

61. The provincial river works are much more numerous and extensive, than would at first be supposed, as in addition to the anicuts across such rivers as the Cauvery, Lutchmenteerth, Yagachy and Hemavutty, a large number of minor streams have been put under contribution, as shewn by General Green, for feeding tanks, &c; and as will further on be observed, in advertising to the many irrigation channels, in the Cudoor and Shimoga Divisions.

62. The antiquity of these works though necessarily of later date than the tanks, is still apparently very remote. The date A. D. 894 is for instance assigned to the great Tulkad anicut, which is the lowest down on the Cauvery, and said to be constructed by one

Madava Rao. Many more are said to belong to the sixteenth century, while others are evidently of an earlier date, and the constructors unknown. After observing that the anicuts had been much neglected under Tippoo

Para 160 of Report dated 5th December. 1804 published with Selections.

Sultan's Government, we find Major Wilks remarking, that "the dreams which revealed to favored mortals, the plans of these ingenious works, have each their appropriate legend which is related with reverence, and received with implicit belief."

63. The only essentially new works, with the exception of Poorniah's channel—constructed in the first years of the present century, for the purpose of leading the sacred waters of the Cauvery to Mysore and Nunjengode, and which will presently be adverted to—are comparatively of minor importance.

64. Excluding the minor channels drawn from rivers on the East of the province, and which are mostly



Aggregate length of channels drawn from the Western rivers. for feeding individual tanks, the following are the aggregate lengths of channels from the Western rivers, and the gross assessments levied.

	Aggregate length of channels.	Assessment.
	Miles.	Rupers.
I. In the Mysore Division from the Cauvery, Lutchmentooth, Shimsha and Noogoo.	46.5	2,40,250
II. In the Hassan Division from the Cauvery, Hemavutty, Yagachy, a branch of the latter river, and the Shimsha ...	231.75	59,097
III. In the Cudoor Division from the Vadavutty, Beerunjee, and Keerisundisamudrah, ...	147.75	34,557
IV. In the Nugur Division ...	362.2	37,917
Total.....	1203.2	3,71,821

65. Rough stone anicats at the heads of these channels raise the water level to the required height, the lowest on the Cauvery being 7 feet, and the highest 25. The channels are for the most part supplied with regulating sluices at their heads, escapes for getting rid of flood water, silt sluices for creating a local sewer to aid clearances, silt dams to arrest the deposit brought down by cross drainages, irrigation sluices for distribution to the fields, &c.

66. To enter upon any very detailed account of the various constructive features, of each and all of these works as at present found to exist, would simply be a waste of time. I shall therefore confine myself to the most general remarks, pointing out particularly the faults which call for rectification.

67. As regards the anicats, I do not think I can do better than quote from the report, sent up to Government in March 1864, with the Estimate for rebuilding the Sreeramadavara anicut across the Hemavutty river, and the work connected with which is now in hand.

"The dam as originally constructed, had a section consisting of a mass of rubble and large stones, the front casing, being composed of stones (about  $3\frac{1}{2}' \times 1\frac{1}{2}' \times 1'$ ), while the aprons consisted merely of large rough stone blocks, averaging ( $9' \times 3\frac{1}{2}' \times 2'$ ) laid in uneven courses, each stone projecting about one third its length, beyond the one above it. All the interstices between the larger stones were filled in, with small and large rubble. From such portions as still exist, it is very clear, that the first repairs were carried out with considerable skill and care; the stones were well shaped and laid in regular courses, each course projecting about  $2\frac{1}{2}$  feet beyond the upper one.

"The repairs during the years 1842—44—59—60, were carried out on a different plan. The general section of the dam was retained, but an attempt was made to

"divide the dam into 3 separate parts, viz., the Eod; the Front slope and the Rear apron, (or as called by the natives, the Narraincuttoo, Goodercuttoo and the Soojicuttoo). The body of the dam was composed of large stones, the largest of which were laid on the top as cap stones. The remaining portion of the dam was constructed with large and small blocks of stone,—see Section B."

68. The above is a very fair sample of the section given by the natives to this kind of work, and shews the fallacy of trusting, as before observed, to the size and position of the material instead of to the homogeneity and cohesiveness of the work as a whole. Here, spite of the employment of the largest blocks and most skilful application of the material, the dam was breached five times between 1842 and 1863.

69. The remedy is, of course, to do away with all loose material; as has been done in the Modern sections. reconstructed Muddoor Dam across the Shimsha, on the section given by Colonel Lawford, and carried out by Captain Johnson, and as now being adopted for the new Sreeramadavara anicut.

70. The natives having invariably selected rocky sites for works of this kind here, there are not the difficulties of a sandy bed to be contended with, and consequently with a sound rock apron, and solid left wall of rubble stone in chunam, there is little to be feared.

71. The chief defect, next to the instability of the native section, is unquestionably the leakiness of works, so constructed, which allows all summer water to escape without rising into the channels. They are thus only practically in action, while the rivers are comparatively full.

72. General Green, while adhering to the native section, successfully corrected this latter peculiarity, by building an im-jervious brick in chunam face wall against the upper side of the anicut, but a little consideration must shew, that while the main constructive defect is left unremedied, this will not suffice. The work still remains exposed to danger during periods of excessive flood. The mere blow of the overfall at such periods, will in time loosen the best constructed needlework (Soojicuttoo); or a tree, as sometimes occurs, hanging on the work, may do the same. And once the very smallest stone is washed or torn out, its neighbour instantly follows, and shortly after the mighty flood concentrating with indescrivable fury rushes into the gap, tears out the largest masses of stone and transports them as mere straws to any distance down the stream, leaving behind a clean breach. As regards the material of face walls, it is also evident that from the want of clay in the soil, the brick manufactured is very unsuitable for hydraulic works, and is readily worn away by water. Crabs moreover drill holes through a wall of this kind.

73. With the object of decreasing the depth of



Other features of native anicuts. water flowing over the anicut during flood, and also no doubt to throw the stream at other times directly into the channel heads, the natives invariably carried the work in a curved line, its general direction trending up stream. The length of the work is therefore ordinarily about double the actual breadth of the river. For other reasons also we find that the crown of the work is at different levels, the part next the head sluice being almost invariably lower than the rest, to relieve the head of water against this work during flood.

74. All these features, dictated by experience as desirable with the peculiar native section, are so many defects, with the solid watertight work now adopted.

75. As regards the regulating or head-sluices, they mostly consist of a series of rough stone posts (4 or 5 feet apart) with caps, and a parapet wall above, affording means of stopping the openings with rough baulks of timber, brushwood, &c.

76. They fulfil their objects most imperfectly, and frequently the flood enters the channel almost uncontrolled, causing breaches, &c. This inability to regulate the stream, led the natives to place an escape in the channel bank close behind the head-sluice, to divert, as much as possible, the surplus flood which entered, back again into the river. This latter work would not be absolutely essential with properly constructed head-sluices. It is often a decided weakness.

77. The channels themselves, as may be premised, are rough trenches, carried round spurs and up to the head of the intercepting valleys, altogether in very tortuous lines to suit the undulations of the country along the river banks, from which, as before explained, they never withdraw to any great distance; partly on account of the rapid side slopes, and partly from defects of levels in original construction. The whole of the irrigation as well as the banks, lie invariably of course on the river side of the channel, and in these banks are placed the sluices, (till lately frequently simple open cuts through the bank itself, called by the natives muddaways) as also the escapes at intervals for surplus water.

78. On the upper side of the channel, the cross drainage from the adjoining high grounds, would necessarily enter the channel quite uncontrolled, were it not

for rough stone silt dams constructed across them. Where there is no great volume of water, these dams answer fairly if kept well cleared in rear, and in proper order; but with large drainages they prove quite inefficient, allowing frequently so much silt to be carried into the channels, as to choke them entirely, and prevent onward flow, thus depriving the fields of all water supply till the obstruction is removed. Sometimes also the cross drainage coming down in unwonted volume, breaches

the opposite bank of the channel, and brings about the same result. Aqueducts are quite a modern introduction.

79. In addition to these works, there are solidly constructed outlets at low levels [locally termed biddigundies] for scouring out accumulated silt at convenient points, but while an undoubted source of weakness, it is not at all clear that they hold out any adequately compensating advantages.

80. Lastly, there are the escapes for surplus water, which, being rough stone works precisely similar in character to tank codies, call for no special description.

It is almost needless to say, that in their present form they are inherently weak.

81. In addition to the numerous constructive defects of these various adjuncts to the channel, there are others of quite as serious a character, if indeed not more so. I allude to channel offences on the part of the ryots, cultivating under them, and whom it is only natural to suppose would be somewhat interested in the preservation of the works, upon which almost their very existence depends.

82. The main defect here has been produced, by the system of permitting irrigation direct from the main or trunk canal. Ryots with the smallest patches of ground to irrigate, deliberately cut through the channel bank, and not only took often fifty times the quantity of water actually required, but left an opening, which unattended to in flood time became an open breach, stopping all irrigation, and entailing great outlay on the State.

83. This defect has, it is true, been to a considerable extent remedied by the construction of masonry sluices by this department, and the practice has been followed by the lately constituted Conservancy establishment. Still, however, the direct irrigation from the main channel goes on, and is the fruitful source of that reckless waste, which not only interferes seriously with the profits of the State, but encourages a spirit of almost lawless independence on the part of the cultivators.

84. As shewing the effect upon the revenue, I beg here to append an analysis of the actual yield in revenue, compared with what it should be, under the measured discharge of the channels in the Mysore Division.

\*Para 14 of Major Pearse's letter, No. 647—107 of the 14th March, 1866. My conviction is based upon the observations I have heard made by trustworthy natives for years past, that not one half of the irrigated land pays condayeri, but especially in Mysore Ashtagram, Putna Ashtagram, Tulcad, Yedatora and Arculgoode. I am certain that nothing like half the cultivated wet lands are assessed. Concealed cultivation is so rampant in the two latter talooks, that I believe both Major Montgomery, and Colonel Clerk, after several attempts, met with such opposition that they were obliged to give up the attempt of bringing the holders to book.



ANALYSIS OF CHANNELS, MYSORE DIVISION.

Name of River.	Name of Anicut.	Name of Channel.	Length in Miles.	Measured discharge in Cubic ft. per second.	Capable of irrigating at 40 Acres per Cubic foot per second.	Assessment at 7½ Rs. per Acre.	Actual revenue as realized in 1864-65.	Yearly loss sustained by the State.	REMARKS.
					Acres.	Rupees.	Rupees.	Rupees.	
CAUVERY.	Saligram ...	Saligram ...	13	40	1,600	12,000	7,172	4,828	{ Most of the land under this channel is Inam.
	Mirlay ...	Mirlay and branches ...	24	151.5	6,060	45,450	19,239	26,211	
	Do. ...	Humpapoor ...	16						
	Choonchicutay ...	Ramasamoodrum ...	24	123	4,920	36,900	12,115	24,785	
	Tippoor ...	Tippoor ...	22	83	3,320	24,900	6,159	18,741	
	Chikodeoraj ...	Chickdeoraj & branches ...	75.5	448	17,920	134,400	60,702	73,698	
	Davroy ...	Davroy ...	8	73	2,920	21,900	4,684	17,216	
	Vijjanuddy ...	Vijjanuddy ...	35	240	9,600	72,000	32,623	39,377	
	Bungardoody ...	Bungardoody ...	9	90	3,600	27,000	7,575	19,428	
	Ramasawmy ...	Ramasawmy ...	31	118	4,720	35,400	23,688	11,712	
	Do. ...	Ragapurwasawmy ...	30	118	4,720	35,100	12,871	22,529	
	Talkand ...	Mahadevamuntry with 4 branches ...	18	153	6,120	45,900	12,878	33,022	
	Hanagode ...	Hanagode and branches ...	71	335	13,400	1,00,500	12,105	88,395	
	Cuttay Mulwaddy ...	Mulwaddy ...	14	140	5,600	42,000	2,394	39,606	
	Hutganhully ...	Sergoor ...	12	150	6,000	45,000	2,369	42,631	
LUTCHMEN-TEERTH.	Do. ...	Hoosainpoor ...	17	224	8,960	67,200	2,892	64,308	{ * The Marchully anicut breach- ed in 1863 is here omitted.
	Saugor ...	Anandoor ...	20	Not given	...	...	4,985	...	
	Cholenhully ...	Cholenhully ...	6	Not given	...	...	1,481	...	
	Muddoor ...	Muddoor ...	12	56	2,240	16,800	7,279	9,521	
SHIMSHA NOOGOO (a feeder of the Cubbany)	Lutchmenpoora ...	Lutchmenpoora ...	4	135	5,400	40,500	7,044	53,456	{ This does not include the revenue under the Muddoor Tank.
TOTALS.....			461.5	2,677.5	107,100	803,250	240,250	569,000	
Averages per cubic foot of discharge per second.			...	1	40	300	90	210	



85. To remove any doubt as to the moderate hypothesis upon which this calculation is based, I may observe, that while I have only assumed that one cubic foot of water per second, is capable of irrigating 40 acres of rice, it would appear by late experiments of the Madras Government, that 44 acres was the result, without taking into account tail water. On the Eastern and Western Juma canals, 90 acres, it seems, are irrigated by the same quantity; and the consulting Engineer of the Madras Irrigation company, in lately fixing the water charge, advocated the standard of 144 acres per cubic foot of discharge (*i. e.* 4,000 cubic yards of water for bringing an acre of rice to maturity.)

Names of the Rivers.	Names of the Channels.	Average length.	Gross Revenue Assessment.
		Miles.	Rupees
Yegachy.	Halwagle Channel	4	609
	Chengravully do...	5	3031
	Arayhully Nullas	3	512
	Moodarhully	3½	514
Canvery.	Kristanaraj Cuttay Channel	35	14,672
	Ramanathpoor do.	18	5,432
	Sreeramadavara Cuttay Channel		
	North	30	3,704
Hemavutty.	Do. Do. South.	12	1,494
	Mundgherry Channel	20	6,355
	Hakky baul do.	6	1,882
	Singapoor do.	3½	342
Branch of the Yegachy.	Hemagherryha do.	19	6,322
	Cummenbady do.	13	6,324
	Culhully do.	9	1,659
	Madapoor do.	10	1,860
Shimsha River.	Keetoor do.	23	1,892
	Bamadahully do.	5	1,251
	Mudgutta do.	6	1,459
	Arakerry do.	5	187
	Totals.....	231½	59,637

from the length [detail as per margin] I must conclude that the loss would be half as much again, making in the gross for the Ashtagram river channels [Rupees  $5,63,000 \times 2,81,500 = 8,44,500$ ] a sacrifice of nearly 8½ lakhs per annum. The Cudoor and Shemoga Division channels, though doubtless equally defective in their way, have not been sufficiently investigated to warrant more than general conclusions being drawn.

87. In making the above statement, my only desire is to bring clearly under view, the wide field open to improvement, by adopting such alterations in the works themselves, as science may dictate, and by putting a stop to all unnecessary waste of water. But in this, as in the case of the tanks, extensive enquiry appears requisite, to determine the general principles of engineering, as well as legislative action.

88. It will here perhaps suffice to indicate, the general direction which it appears desirable, that improvement in the works should take.

86. The direct inference is, that from the numerous constructive defects, and the wasteful habits into which the ryots, almost without check, have been allowed to fall, no less than Rs. 5,63,000 are lost yearly to the State. I have not the gauged delivery of the channels in the Hassan Division, but judging simply

89. The first and most important point, is the substitution of solid water-tight anicuts for the old native section, as before adverted to. This change, already initiated in the re-construction of the Muddoor Anicut under Colonel Lawford, and being now extended to the Sreeramadavara dam, would, I have little doubt by the simple force of circumstances, and efflux of time, have extended itself gradually to all the old works. But with the present determination of Government to deal thoroughly with all irrigation works, it appears desirable to secure a definite recognition of the principle. I may therefore be excused some further observations on the point. 108

90. From the list of anicuts given with Major Wilks' report, of the 27th March 1807, it would seem that notwithstanding the great efforts made by Poorneah to bring all works capable of repair into working condition, there were still 13 out of 35 anicuts breached, or out of order. Again in the Administration Report of 1864—65, there are 8 out of 28 shewn to be similarly situated. Then, as now, works constructed on the old native model, have therefore as a fact been constantly breached.

\* \* \* \* \*

92. We have, however, still more precise information on the subject of the Sreeramadavara anicut. In the report attached to the estimate for re-constructing this work, it was shewn that up to 1840, the work had been breached four times, previous to its final disruption in the monsoon of 1850, and that, taking the whole revenue and outlay without interest, between the two periods, there remained only Rs. 20,684 in favor of the work. As the repairs of this great work in the old native fashion would have cost Rs. 50,000 it was clear that, if adopted, the result must have started at a clear loss of Rs. 29,316, without at the same time any guarantee that it would have stood a bit better than it had ever done before.

93. Leaving entirely out of account, the distress and loss to the village communities dependent on these river works, I cannot but think that this evidence, of certain and frequent failure in weirs so constructed, makes their restoration on the same plan extremely undesirable, if on no other ground than their being financially unproductive.

94. The substitution of the new solid anicuts advocated, would cost it is true at starting about three times as much; but in the first place the expenditure is once and for ever; and in the second, a weir of this kind, does three and four times the work of the other. With the leaky anicuts and the excessive waste of water now going on, a second and third anicut is always required lower down, to pick up and re-distribute the water, which percolates through the upper dam, or is thrown back unutilized.



ed from the channels into the river. Nothing of this kind would be required with works constructed on proper principles, and consequently several existing anicuts could be dispensed with, with manifest advantage financially and otherwise.

95. The channels drawn from these works might moreover be extended immensely in length, opening up wider sheets of cultivation than has yet been practicable. Above all, from the new anicuts being impervious, every drop of water below their crowns would be passed down the channels, thus affording a certain and constant supply at all times, in the dry season, and allowing such valuable crops as sugar-cane, and mulberry to be raised in addition to rice.

96. The second point which is almost of equal importance, is the prevention of irrigation direct from the channels before alluded to. The cure here is to isolate entirely the main channel, placing it under scientific control, and allowing the distribution of water to take place, only at certain intervals into secondary channels, from which alone the ryots should be allowed to draw their supplies—to adopt in fact the Rajbaha system of the northern canals, to the different requirements of Mysore. The chief distributory or rajbaha, would of course here run everywhere, alongside of the main channel, to the riverside, and delivery into it, would be made by a separate and responsible agency, the main channel being fenced off and otherwise protected from all interference, precisely in the same manner as the railway.

97. As regards the other essential changes, such as substituting proper regulating sluices to all channel heads, providing aqueducts or other means for passing objectionable cross drainages, &c., the necessity for all these improved arrangements are too well recognized to call for any special remark. They have already been initiated and should now be adopted systematically.

98. I shall only allude to one more general principle, which might with advantage obtain definite recognition. The defective construction of existing anicuts and channels, have led to the water passed down, being wholly expended in direct irrigation. The only instances to the contrary, with which I am acquainted, are the great Chickdevasagur and MudJoor channels, which in addition to carrying water for direct irrigation, pass down during freshes sufficient extra water for feeding terminal tanks. With shutters on the new description of anicut,

and an increased section and bank to the channels, large quantities of surplus water, could no doubt be frequently passed down, during moderate freshes, and numerous storage reservoirs supplied at the end of the improved channels.

99. It may I think be safely pronounced, that all the existing Mysore channels are improvable to an almost unlimited extent as indicated above, and that in the legitimate development of these works, the most ample and profitable employment of capital may at present be found, without seeking for essentially new undertakings. The materials are to a great extent on the spot, and the population is both fixed, and from time immemorial, accustomed to rice cultivation.

100. There is, I believe, only one channel in Mysore, which does not appear to be improvable to any extent. I allude to Poorniah's nullah. Poorniah's nullah before adverted to, which, as shewn in the \* feet note, was undertaken in the hope of introducing into a Hindu town the holy stream of the Cauvery, and which, even if finished to the full original intent, would have conveyed but an insignificant stream, with "little perceptible motion." From the head at Tippoor Anicut, the total length is some 78 miles, and the excavations are in the vastest scale—a portion of the latter, near the town of Mysore, being 100 feet in depth through solid rock. Failure of funds or other cause, put an end to this gigantic and profitless religious conception.

101. In quitting this portion of the subject, I would beg briefly to note the number and extent of channels under the Hemavutty and other rivers in Chickmugloor and Cudoor Talooks, as also the minor ones in the Shemoga and Cudoor Divisions.

*\*Extract from Captain Mackenzie's report of 22nd March 1807.*

Para 27—"The Canal (Poorniah's Channel) is about 20 feet wide, and at the highest will only carry off from 3 to 3½ feet of water on a level, admitting of little perceptible motion, while the river here passes with a considerable degree of velocity from its greater destination."

*Extract from Major Wilks's covering letter to the above, dated 27th March 1807.*

Para 9th. "It is probably known to His Lordship in Council that the projected canal for conveying the waters of the Cauvery from Tippoor, across the Lutchmenteerth to Mysore, has not cultivation for its primary object.....it was, of course, undertaken by the hope of introducing into a Hindoo town the holy stream of the Cauvery." &c.



*Abstract of Anicuts, and Channels constructed on the Vedavutty, Billah, Beerinjee, and Keerisuntisamudra stream in the Chickmugloor and Cudoor Talooks.*

Names of Rivers.	Number of anicuts across each.	Number of Channels.	Gross length of Channels.			Gross Revenue.			Remarks.
			Miles.	Fur.	Yds.	Rs.	As.	P.	
Vedavutty ...	56	75	120	5	153	30,856	6	1	4. Anicuts built of brick in mortar. One Do. Do. of stone in Do. and the remainder of rough stone. 33 Channels in good order and 42 in bad order.
Billah .. ..	1	1	1	4	19	230	12	1	
Beerinjee Hullah.	6	6	13	5	155	3,404	5	1	The anicut is built of rough stone, and channel in good order.
Keerisuntisamudra Hullah ...	1	0	2	0	0	65	9	8	
Total.....	64	82	137	7	107	34,557	0	11	

*Abstract of Anicuts and Channels in Shimoga and Cudoor, in their local distribution according to Talooks.*

TALOOKS.	Number of Anicuts.	Length of Channels.		Corresponding Revenue Rupees.	Drawn from feeders to what rivers.
		Miles.	Yards.		
Saugor	46	8	982	8,784½	Sherawutty
Nugur	22	14	"		Wurdah
Cowlidroog	19	6	880	754	Sherawutty
Luckwully	7	5	1,557	687	Toonga
Soorub	15	107	440	5,179	Buddra
Shikarpoor	2	7	100		Toonga
Shimoga	22	16	1,648	4,063½	Wurdah
Honnabully	8	25	780		Choardy
Terrikerray	3	4	0	1,828	Wurdah
Anantapoor	22	63	0		Toonga
Wustara	3	0	0	219	Toongabuddra
	4	2	714	49½	Buddra
	4	5	440	1,355	Wurdah
	4	8	0		Choardy
	5	11	0	5,995½	Sherawutty
	64	77	995		Beerinjee
Total.	250	362	1,496	37,917	

102. It remains only to review briefly the chief works under this head, lately completed or now under execution, before stating what projects it is proposed to bring forward in next Budget.

Projects lately completed or under execution.

103. The chief completed work is the re-construction of the Muddoor Anicut, across the Shimsha river,

and 10 miles north of a town of the same name. \* \* \*  
The dam is 900 feet long, and raises the water level about 14 feet. It is capped with granite slabs and backed with dressed stone. The channel leading off from the right flank of the work.



[there is no left bank channel] feeds 8 tanks, including the large Cusbeh tank of Muddoor, under which the present assessment is Rs. 7,190 per annum.

104. The scheme has by no means as yet received its proper development, but in a report previously submitted to the Commissioner, (dated 3rd October 1865,) I was enabled to shew, that while the total outlay all included, should not exceed Rs. 92,000, the actual returns, after deducting Rs. 4,000 for repairs, ought to amount annually to Rs. 41,540, or 45 per cent on outlay.

105. A similar project now in hand for re-constructing the Sreeramadavara Anicut across the Hemavatty, near Nursipoor in the Hassan Division, is estimated for anicut and head sluices alone at rupees, 1,81,000. The length of the dam is over 1,000 feet and its average height 22 feet—, rock bottom as in Muddoor.

106. The extension of the old channels has not as yet been estimated for in detail, but it was roughly calculated that their aggregate length would be 80 miles, with a delivery of 100 cubic feet of water per second, and that the total cost of the improvements including the anicut, would be Rs. 3,50,000. Allowing 40 acres of rice land to each cubic foot of discharge, and 6 Rs. per acre as assessment, after deducting repair charges, the net receipt would be Rs. 96,000 per annum, or over 27 per cent on prime outlay. It will no doubt take some years before this project is fairly worked out, but much of the material is already prepared.

107. On the great Chickdevasagar channel, two large aqueducts, the Anchayhulla and Lokani, are now in hand, and many other minor works. other works of restoration and improvement have been completed, both in the Mysore and Hassan Divisions, with some of still less importance in the Bangalore, Cudoor, and Shimoga Divisions, but they do not call for any special mention here.

108. As regards the works to be brought forward this Budget, there is only one which it seems requisite to notice, namely, the project for re-constructing the Marchully anicut across the Lutchmenteerth river, the old work having been breached in 1863. The new dam on the solid principle will be built above the present site, using, however, the material of the old work. Its length will be 268 feet, raising the level some 12 feet, costing in all Rupees 23,889 in which is included Rs. 6,000 for a new right bank channel. The returns from this project should be quite as favorable as the Sreeramadavara dam.

109. It would of course be impossible, with the present information on the subject, to hazard more than a guess at the probable cost of improving the Mysore river works, on the principles now ad-

vocated; judging however from the work already accomplished and estimated, I should suppose, it would not exceed 30 lacs of rupees. With the 90 lacs before approximately estimated for the tanks, the total would thus be £ 1,200,000. On the supposition however, as pointed out by Mr. Bowring, that the agriculturists themselves bear a considerable portion of the burthen, not more than £ 800,000, or at the outside a million pounds sterling, would have to be furnished by the State, in order to accomplish this great, and, as I submit, truly national work.

110. Shortly since, I believe, the amount required (one million) was actually in hand as surplus deposit, but although a considerable portion has been absorbed in paying the rajah's debts, and investing funds for His Highness's family, there is still a fair sum over; and so elastic has the revenue proved, that last year there was nearly 8 lacs surplus after meeting all charges.

111. The proposal which, with the utmost deference, I would venture to submit for the consideration of His Excellency the Governor General in Council, is, that accepting one million as the probable outlay, required for bringing all existing irrigation works up to standard, the actual execution be spread over 10 years—giving in fact an average outlay of 10 lacs per annum, (over and above the normal departmental Budget) which should either be met from existing surplus funds, or by small loans from time to time as occasion may require.

112. The raising of wet crops is what the nation can do best and cheapest, besides being the avocation to which all its instincts have tended from time immemorial; and, as I have sought to shew, that in the repair and development of existing works of irrigation, lies the true method of obviating the horrors of drought and famine, it is only reasonable to conclude, that, while following the dictates of humanity, the outlay thus rendered necessary, happily under the peculiar physical condition of Mysore, must at the same time prove by far the most profitable investment that could be made. Inadequately therefore as I have brought this vitally important question under notice, I trust that it may command the fullest and most favorable consideration.

113. I have hardly adverted to the subject of actually new irrigation works, for reasons previously explained. This should however not by any means be supposed to indicate either my indifference to such works, or my holding an opinion as to their inadvisability when the means admit, and proper opportunity presents itself.

114. An examination of the table given in para 59 shews at once the great quantity of water escaping to the ocean, and there can be no question that a large proportion of this could be turned to account in Mysore,



without in the least interfering with any vested interests in Madras. This is a subject which was disposed of with great ability in March 1807, by the then Acting Resident, Major M. Wilks, and the Surveyor General, Captain C. Mackenzie of the Engineers (see their reports, dated respectively 22nd and 21st March, re-printed 1863;) and by all acquainted with the subject, it will I think be unquestioned that in addition to storage (or rather intercepting) reservoirs at the head waters of some of the rivers, the great streams of the Toonga, Buddra, Cubbany, and others hitherto untouched, might yet be utilized to almost any extent. With the extensive re-construction of existing works in the next 10 years, which I have advocated, and the completion of the great net work of communications already well advanced, the revenue will, it can hardly be doubted by that time, have received an impetus, which will not only render the construction of great new works of irrigation, a matter of comparative ease, but perhaps as great a necessity, as the repair and development of existing works is at this moment.

115. But in order to carry out the plan, which at present appears to me both feasible and requisite, it is above all essential that there should be not only an adequate establishment for carrying on current duties, but some special agency for examining systematically the existing works, and submitting projects for sanction. This I believe to be quite in accordance with the views of Government, who, in the circular under reply, direct that application be made for such "addition of Engineers or Subordinate staff as may be needed."

116. I have ventured frequently to bring to notice, the entire inadequacy of the existing establishment even for the present operations of the department, and the undue responsibility thus thrown upon its members. At this moment there are five young Assistant Engineers acting as Executive Engineers of Divisions, averaging 3,500 square miles in extent, and as above shewn, covered

in nearly every square mile with tanks or other irrigation works, perpetually calling for attention. There are also 18 Upper Subordinates for the whole extent of Mysore, and with reference to this and \* Code page 193 para 10. as also the last Progress Report showing 2,129 miles of main completed road under their charge, I would submit that for the proper maintenance of these works of communication alone, there are not even now, one half the number on the scale laid down for guidance. 1086

117. This excludes entirely the large new works in bridging and road work, of which there is a vast amount going on in every direction, and *wholly* leaves out of the question the anicuts, channels, and tanks whose numbers and magnitude I have attempted to describe. It can be matter of no surprise to any one in the least acquainted with the nature of the case, that these works have not been treated in a systematic manner; in fact the only wonder is, that they have not deteriorated in the most deplorable manner.

\* \* \* \* \*

120. In conclusion I may be permitted to remark that having myself no personal wish to gratify, it would be matter of great satisfaction to me, if Colonel Strachey's mission to be extended to Mysore. Strachey's experience could be brought to bear upon the whole question after, or in immediate connection with, his projected mission to Madras. I have little doubt that he would see the necessity of a special irrigation branch, under a responsible head for this province, similar to the system of canal administration in Northern India.

I have, &c.,

BANGALORE, (Sd.) R. H. SANKEY, MAJOR, R. E.,  
19th November 1866. Chief Engineer of Mysore.

\* "Upper Subordinates on a finished main road will have charge of subdivisions of about 50 miles each."